WAR FOOD ADMINISTRATION
Office of Marketing Services

C A S H E W N U T S

by Georgia E. Cantrell, Economist

Cashew fruit -- a bunch containing nuts attached to apples.

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Illustrations in this publication were taken by E. B. Soans, of Mangalore, South India, in 1940, and were obtained through the courtesy of the State Department.

CASHEW NUTS 1/

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Development of the Cashew Nut Industry

The expansion of the cashew nut industry and the increasing importance of these nuts in world trade during the last 20 years reflect the application of scientific research and its value in solving the problems of marketing agricultural products.

For many years, cashew kernels in the crude state with the red skin still on them were imported into Europe as a substitute for filberts. This trade often reached substantial proportions, particularly in years when the filbert crop was short. In some years, as much as 2,000,000 pounds were reported to have been brought into Europe through the French port of Marseilles.

During the years 1900 through 1920, attempts made to popularize crude cashew kernels with bakers and confectioners in the United States were largely unsuccessful. This was attributed mainly to the high percentage of spoilage from insect infestation and general dissatisfaction with the unsanitary condition of the product.

Immediately after World War I, attempts were made to import blanched cashew nuts into the United States in various kinds of containers. Although occasionally small lots of nuts of fair quality were brought in without insect infestation, the risk was so great that acceptance here dropped to relatively low levels. Strict inspection by officials of the United States Food and Drug Administration resulted in some years in the condemnation of as much as half of the shipments into New York as being unfit for human food.

During the years 1920-23, the commercial method of packing food products in inert gases known as the "Vitapack" process was perfected by a large domestic food products company. This method, as finally applied to cashew nuts, consisted primarily in removing the air from a flexible walled metal container filled with the nuts, and replacing the

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1/ Information contained in this report was obtained from the sources of literature cited at the end of the report and from the special processed reports or other sources indicated in footnotes.

air with a suitable gas, usually carbon dioxide, partly soluble in the oil of the nuts. Laboratory experiments indicated that this method of packing would solve the problem of insect infestation of imported cashew kernels. As the result of these laboratory experiments, a test shipment was made in 1923 of cashew kernels packed in India by a chemist of the food products company. The test shipment was favorably received by salters and the public generally, and since that date imports into the United States continued to increase steadily until the outbreak of the present world conflict.

Description, Botanical Classification, and Related Information

Having solved the problem of preventing insect infestation of cashew nuts, further studies relative to environmental conditions affecting production of the nuts, particularly climatic requirements, areas of distribution, and commercial producing areas were initiated as were also studies relating to factors affecting quality and the establishment of grades and commercial standards for the export shipments (12). 2/

The cashew nut belongs to the family botannically known as Anacardiaceae, also generally known as the Cashew family. This family comprises some 60 genera and 400 species, including many important plants widely disseminated throughout the world mainly in the tropical areas. Other outstanding economic plants of this family besides the cashew are the mango (Mangifera indica) and the pistachio nut (Pistacia vera). 3/

Two of the species, poison ivy and poison sumac are well known because of their discomforting poisonous constituents. The cashew nut shells also contain a poisonous substance. Some people who handle the raw cashew nuts during the roasting process are subject to a poisoning or irritation to their skin which is similar to that caused by poison ivy, poison oak, or poison sumac. In some instances, this poisoning may be serious, resulting not only in a great loss of time on the part of workers but in severe discomfort, pain or inconvenience to them. 4/

The cashew tree is an evergreen tree attaining, under favorable olimatic conditions and suitable environment, a height of 30 to 40 feet with a spread of 60 feet. It thrives on almost any soil, expecially on sandy places and at low elevations. For this reason, it is important in coastal dune reclamation. In Brazil, favorable development is reported on high tablelands as well as in low places, and in clay as well as in sandy soils.

2/ Numerals in parentheses refer to literature cited at the end of the report.

3/ Long, J. C. The cashew nut. United States Department of Agriculture, mimeographed report. 7 pp. illus. November 1932.

4/ United States Bureau of Plant Industry, Soils, and Agricultural Engineering. Private communication.

The heavily veined, leathery oval leaves, from 4 to 8 inches long and 2 to 3 inches wide, are clustered toward the ends of stiff branchlets. The small rose-colored flowers are polygamous and appear in clustered panicles 6 to 10 inches long, terminating young branches. In India, the cashew flowers in December and January and the fruits or nuts mature in March or April; in Brazil, it flowers in August and September and the nuts ripen from November to February; in Portuguese East Africa, the producing season lasts from November to March; in Madagascar, the cashew flowers in February and the nuts mature in June.

The nut which is truly the fruit, is from 1 to 1½ inches long, kidney or heart-shaped, and is borne on a fleshy receptacle or enlarged stem called the "cashew apple." The nut develops first from the flower, and the "apple" grows later between the nut and the branch. The kernel is enclosed in a shell or covering about one-eighth inch thick, consisting of a soft, oily outer portion, gray in color, and having a thin interior shell. Between these two, is a honeycomb of cells containing a resinous material which is a natural protection against insects. There is a thin membranaceous seed coat, covering and adhering to the kernel proper. The kernel is slightly curved, white, of fine texture and delicate flavor. It is from 3/4 to 7/8 inches long.

The "apple," or enlarged stem is about 2 to 4 inches long when mature. It varies in color from white or yellow to red and gives off a characteristic, pleasing penetrating aroma. It resembles a medium-sized Bartlett pear in shape, although it is usually shorter and more truncated. The interior is whitish, soft, easily bruised, and full of juice. It is highly astringent before maturity and retains enough of this property when ripe to lend it zest.

Propagation, Environment, Culture

The commonest means of propagation of cashew trees is by seeding. Propagation, however, may be effected in greenhouses, with cuttings of mature wood, leaves retained. The plant can also be successfully layered or grafted or propagated by use of nonpetioled mature buds in shield budding.

In its native habitat, commercial cashew-producing groves may be prepared by clearing away enough of the jungle vegetation to afford space for growth of the cashew. In other areas where the plant has become naturalized, the tree exists in a semiwild state, and receives little horticultural attention although it grows vigorously, multiplies rapidly, and yields abundantly. 5/

The British Indian Government is reported encouraging greater production and improved methods of culture. Literature was circulated some years ago suggesting the establishment of a nursery where young seedlings or plants of higher-quality stock could be given better care

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5/ See footnote 3, p. 2.

and distributed for transplanting into commercial-producing areas, thereby increasing production and raising the quality of the product. Some nurseries are now operating although propagation by seeding continues (8). Seedling trees vary in the character and quantity of the fruit produced. In Brazil, some of the best trees have been given varietal names to distinguish them, and some have acquired local reputation (5, 6).

The general practice in seeding in India is to drop 2 or 3 seeds in pits about 1 cubic foot in size and from 15 to 20 feet apart just at the break of the monsoon in June or July. Subsequently, the weak seedlings are removed, leaving a single plant in each pit. In certain districts seedlings are transplanted in the pits. The seedlings require watering for the first 2 years but little or no attention is given afterwards. In the main, no systematic cultivation or fertilization is done but experiments have shown that such practices are effective. The optimum number of trees per acre is 100, although occasionally 150 to 200 trees are grown. 6/

Trees begin to bear at about the 3rd or 4th year and reach full bearing about the 7th or 8th year. Maximum yields are usually obtained from the 10th to the 30th year after which production tends downward. Due to the fact that trees are scattered over relatively large areas, estimates of yields show the wide range of from 350 to 2,000 pounds per acre. Under good plantation conditions, yields of 2,500 to 3,000 pounds per acre may be obtained. Annual fluctuations of yield are generally reported to be small and, in most instances do not go beyond 10 or 15 per cent above or below normal. 6/ 7/

Distribution, Principal Commercial Areas

Cashew trees are abundant in their wild state in their native habitat of Brazil and other tropical areas of Central and South America and the Caribbean Islands. They also exist in considerable abundance in the areas of Asia and Africa to which they have been transported (4, 8, 9, 10).

As a result of the development of a satisfactory method of packing the nuts and the materialization of an active demand in the United States for cashew kernels packed in India under supervision of American chemists and in accordance with United States trade specifications, the commercial industry became largely concentrated in British India. Other factors contributing to the location of the Indian industry included favorable climatic and environmental conditions for production of the raw material

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6 Jordan, Curtis C. The cashew nut industry in South India. United States Department of State, Foreign Service, voluntary report No. 6789. 101 pp. illus. January 10, 1942. (Unpublished.)

7/ Adair, Charles W., Jr. The cashew industry in Bombay Province. United States Department of State, Foreign Service, required report No. 28030. 48 pp. October 14, 1942. (Unpublished.)

as well as certain economic factors including the adequate supply of efficient and relatively low-priced Indian labor. India is, by far, the most important commercial producing area for the blanched, shelled cashew kernels of commerce (1). Other areas are potential producers of large quantities of nuts, such as the tropical parts of Brazil and other countries of South America and the Caribbean Islands, where the trees grow wild, and in Africa particularly the Portuguese possessions and some areas under British and French administration.

The principal commercial producing areas of British India are located in Tracancore State, the Madras Presidency and Cochin State, and smaller quantities are produced in the Bombay consular district. During the past 10 years, the area under cashew trees in India is reported to have been steadily expanding in response to the increasing demand for kernels for the United States trade. The increase in the acreage during the years 1930-39 is estimated at 15 per cent. The recently developed acreage is readily distinguished from the older producing areas by its systematic cultivation on a plantation basis. Improved methods of cultivation and collection have increased the volume of cashew nuts harvested in British India by some 10 per cent. Thus, the larger area and the improved methods of culture and collection have jointly resulted in a gain of some 25 per cent in the volume of cashew nuts in India during the years 1930-39.

No complete or definite estimates of the cashew acreage are available, since a large proportion of the cashew trees exist in a semi-wild state in scattered areas or on waste land. Cultivation on a plantation basis for which statistics could be provided is a comparatively recent development. The Madras Presidency, which accounts for roughly 45 per cent of the total Indian crop of cashew nuts, has approximately 45,000 acres of cashew trees. Of this acreage, one-third or 15,000 acres is located along the West Coast of the South Kanara district, 10,000 acres in the West Coast districts of Malabar, 7,000 acres in Trichinopoly, 6,000 acres in South Arcot, with smaller areas in other districts. Since these areas include the most concentrated areas of production and account for somewhat less than one-half of the total Indian crop, it would appear that the total acreage of commercial producing cashew trees would be in excess of 100,000 acres.

The progressive upward trend in the volume of unshelled nuts grown and harvested in India during the period under review is largely accounted for as a result of expanded area and improved methods of harvesting. During the early years of the industry little attention was given to care in harvesting, and careless gathering of nuts resulted in heavy loss. 8/ 9/ The estimated quantity of nuts harvested in India, together with quantities imported from East Africa and the quantity of unshelled nuts available for processing, is shown in Tables 1 and 2, and in figures 1 and 2.

8/ See footnote 6, p. 4.

9/ See footnote 7, p. 4.

Ranking next to British India in commercial production is the colony of Mozambique which is the largest exporter of unshelled nuts to India. Cashew nut trees grow in the coastal plain of the entire colony of Portuguese East Africa. The most important producing region is situated in the northern part of the province of Mozambique. The Mozambique Government is encouraging production and experiment station work through maintenance of plantations under government control. The reported acreage in these plantations is somewhat less than 10,000 acres but production under Government control comprises only a small part of the total commercial available supply. Actual commercial production is determined largely by the dealers' orders for shipment rather than by the quantities of nuts which could be harvested. The dealers are mainly British Indians who, until recently, held a practical monopoly of the trade. When the dealers have determined the quantity of nuts to be shipped, the natives are notified of the quantities which need to be gathered. 10/

In addition to the Portuguese possessions in East Africa, cashew trees exist in a semi-wild state in other regions along the eastern African coast and a small commercial production of the unshelled nuts is reported particularly from some of the areas under British and French influence. Included among these are the areas under British administration --Tanganyika, Kenya, Uganda, and Zanzibar and the French island of Madagascar. Ceylon has a small production and has in a few years reported marketings and overseas shipments of shelled nuts (9, 10). So far, production in these areas has been of minor significance in world trade.

The greatest areas of potential development of an important cashew nut industry are the tropical regions of South America and the Caribbean Islands where the trees grow wild. In Brazil, the cashew is native to the northeast coast and grows on practically any type of soil, although it thrives for the most part on the sand dunes of the northeast in open or semi-open country. Brazil has for a number of years produced small amounts of cashew kernels but the quantities of cashew nuts left unutilized in Brazil each year reaches enormous proportions (11). A relatively small volume of commercial production of kernels is reported in certain Caribbean countries such as Haiti, but like Brazil and other countries of Central and South America, commercial production in these areas has not been fully developed.

International Trade in Cashew Nut Products

International trade in cashew kernels consists primarily of the exports of the shelled and roasted kernels from India to the United States. The United States has imported small quantities of kernels from

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10/ Ebling, Samuel G. The cashew nut trade in Portuguese East Africa., United States Department of State, Foreign Service, voluntary report No. 11688. 5 pp. May 5, 1938. (Unpublished.)

INDIA: CASHEW NUTS, QUANTITY HARVESTED, IMPORTED AND AVAILABLE FOR MANUFACTURE, 1925-44

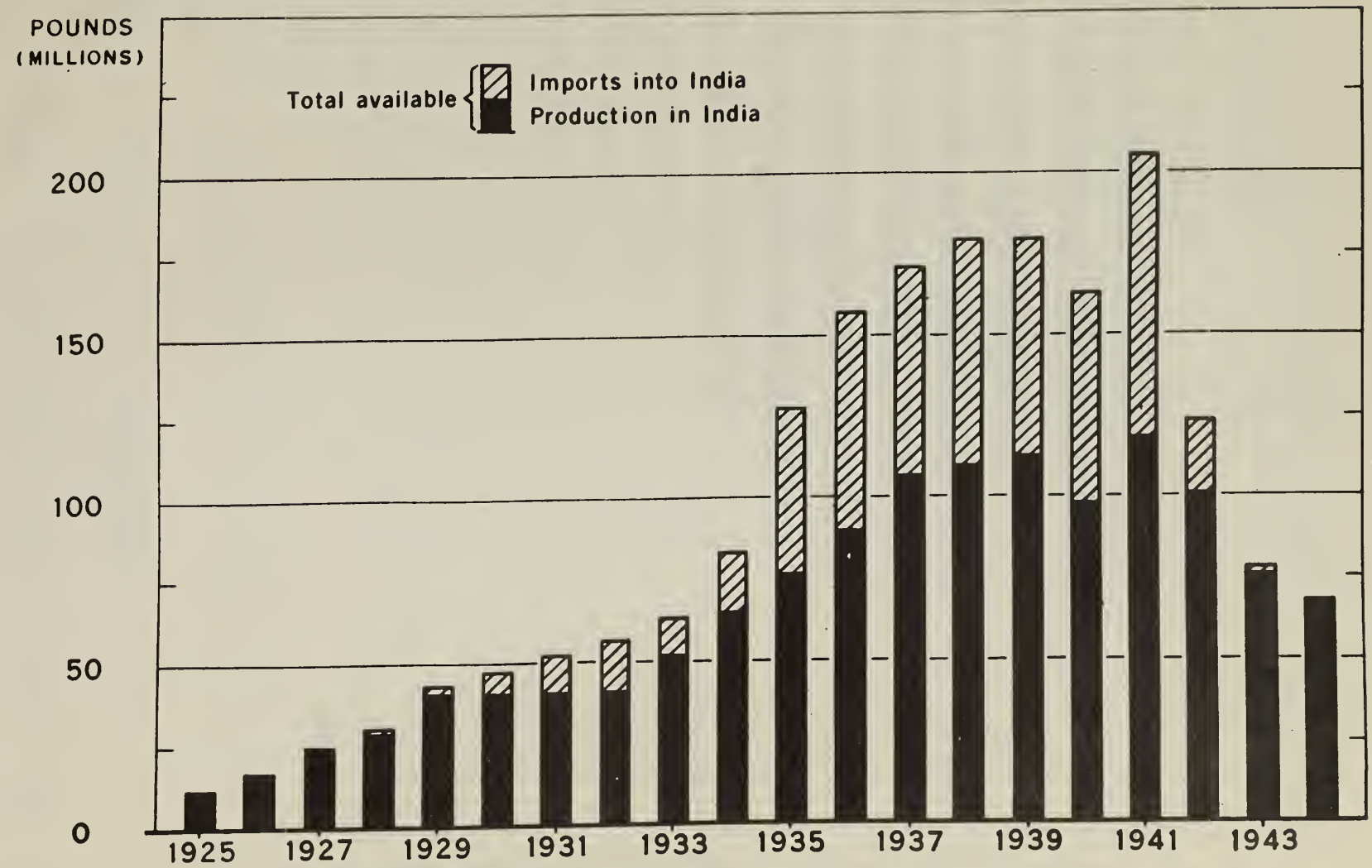

Figure 1.- From data of table 1, appendix.

CMS Neg. 852

INDIA: CASHEW KERNELS, ESTIMATED PRODUCTION AND APPARENT DISPOSITION, 1925-44

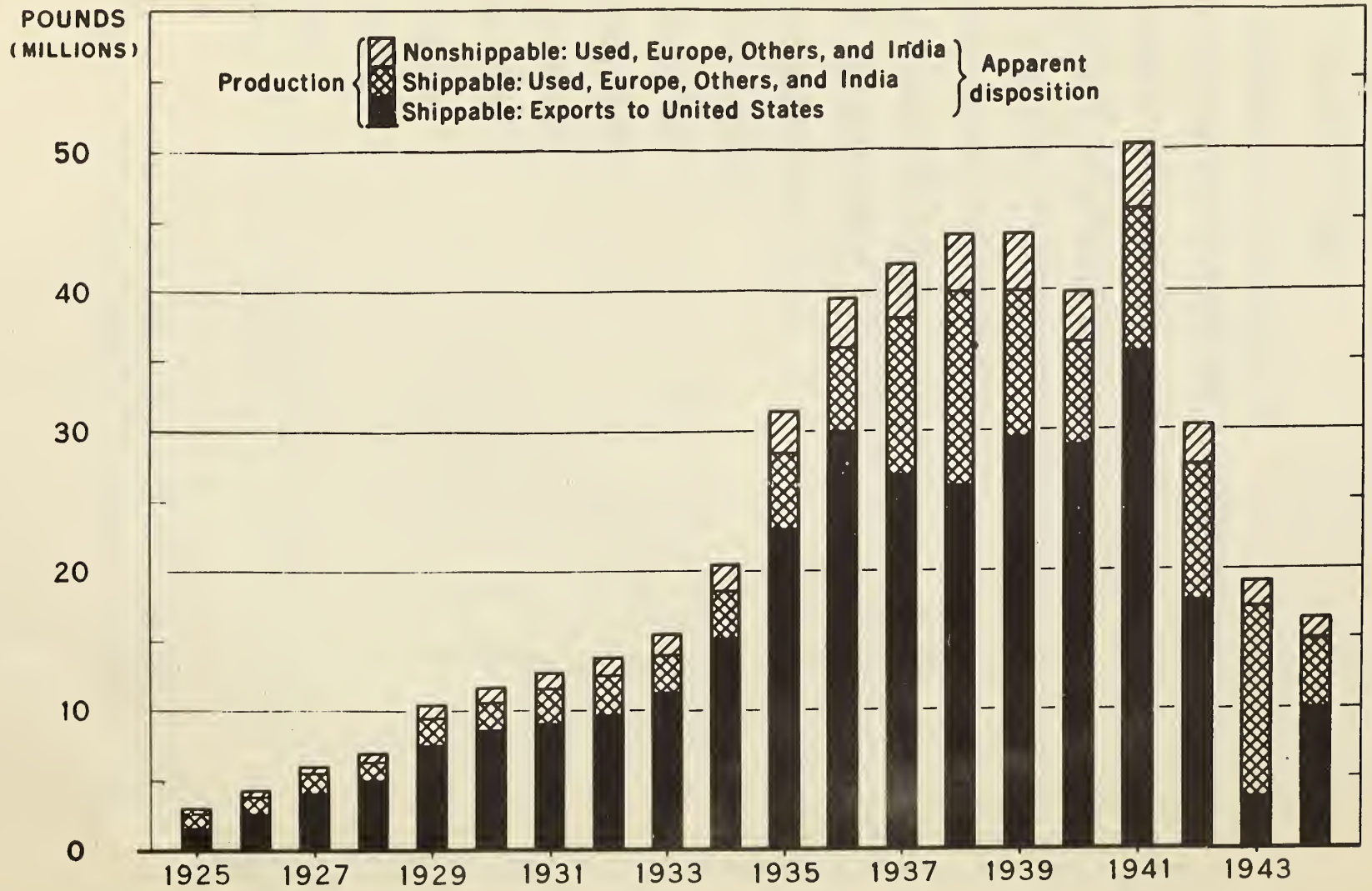

Figure 2.- From data of table 2, appendix.

OMS Neg. 853

other countries but in no year have the combined imports from areas other than India aggregated as much as 500,000 pounds. Likewise, India has maintained a small trade in shipments of cashew kernels to certain European and other countries than the United States but these, on the whole, comprise a relatively small percentage of the Indian export trade.

In the absence of an historical series of official statistics of the British Indian export trade, since cashew kernels have been reported separately only since 1937 in the Indian official export statistics, possibly the best measure of the expansion of Indian exports is shown in the official import statistics of the United States, more than 98 per cent of which are of Indian origin. (See Table 3.)

Canada has reported separately imports of cashew kernels only since April 1939. These data are of current interest, however, because of the substantial gain in imports. Such imports for the calendar year 1941 were more than double those for 1940, with those for 1942 showing only a slight reduction from the record 1941 figure. The available official data are shown in Table 4.

The relative position of the United States as a customer of India in the exports of cashew kernels is shown in Table 5 of the official Indian export data for the years for which these data are available.

Brazil has been an irregular exporter of cashew kernels for a number of years (Table 6) but commercial development has not progressed substantially because of the competitive advantage of India in its cheap labor supply. As the result of the lack of a well-organized trade in Brazil, enormous quantities of cashew nuts have been abandoned as waste each year. With the interruption to ocean transportation during World War II, interest in the development of the Brazilian industry has revived and several companies in the United States are reported to have become interested in the establishment of the industry in Brazil partially for the purpose of production of cashew nut shell oil. Reports indicate that a machine has been devised for shelling the nuts mechanically at a cost much below the hand-shelling method formerly employed. An additional factor stimulating commercial production of the kernels, particularly during the past few years, has been the increase in price. Some cashew nut shell oil is reported to have been exported but no official statistics of the exports have been published. 11/

Mozambique is, by far, the most important exporting area of the raw unshelled nuts. Practically all of these nuts are destined for British Indian ports for processing. 12/ The trend of shipments from this area is shown in Table 7.

11/ Maness, Hubert. Brazil: The beginning of the cashew nut industry. United States Department of State, Foreign Service, report No. 997. 2 pp. October 31, 1944. (Unpublished.)

12/ Hunt, Frederick D. Cashew nut trade, Portuguese East Africa, 1942. United States Department of State, Foreign Service, report No. 1. 3 pp. November 19, 1942. (Unpublished.)

Few official statistics are available to indicate the international trade, in cashew nut shell liquid, since in most official publications it is not separately classified. It was not separately classified in United States import statistics until 1943. However, since no commercial production of kernel oil is reported in either Brazil or India, it may be assumed that the general classification, including kernel oil and nut shell liquid, consisted entirely of the nut shell liquid (Table 8). Canada has provided separate classification since April 29, 1941 (Table 9). While these imports are credited to the United States, they probably represent re-exports of the shell liquid originating in Brazil or India.

Economic Importance of the Cashew Nut Industry

The cashew nut industry is still in its early stages of development, having achieved importance as a manufacturing industry of substantial proportions only in India. This concentration of the industry in India and the expansion of world trade in cashew kernels are attributed largely to the interest and encouragement of American food manufacturers and distributors.

Although cashew kernels may still be considered as the primary product of the industry, cashew nut shell liquid has come into prominence during the emergency as a strategic war material. It is largely used in resin solutions for impregnating electrical coils, in manufacture of brake linings or other friction elements for autotrucks and aircraft, and in molding resins for insulating aviation electrical parts. The cashew liquid represents roughly 35 per cent of the weight of the shells and around 20 per cent of the weight of the entire nut. This shell liquid is reported to be the most economical source of chemurgic phenol (2). The oily liquid in the shell of the cashew nut appears to be almost completely phenolic in character. Its major compenent is anacardic acid, which is present to the extent of about 90 per cent and the remainder is mainly cardol. Anacardic acid readily loses carbon dioxide on heating to yield a monophenol, known commercially as "Cardonal" (15). Resins, prepared with formaldehyde, from this commercial "Cardonal" are of the thermosetting type but while hardening under the influence of heat also have the property of becoming rubbery at elevated temperatures and have thus provided a most satisfactory friction-fortifying agent (2). Further research in the use of cashew shell liquid for industrial purposes during post-war years may have an important bearing on the future of the industry.

The cashew apple is also used in producing areas in various ways. In Brazil, large quantities are consumed as fresh fruit or are preserved or otherwise processed. The apples are also used for production of fermented liquors or wine, noted especially for their high mineral content. They may also be used for production of vinegar (5, 6, 11). Similar uses of the apples are reported for other producing areas. While these

uses are, as yet, mostly of only local significance, they are potentially of considerable economic significance with fuller and more complete organization of the industry.

The Indian cashew nut industry, which has been the chief source of blanched kernels for the United States import trade and which during World War II has supplied the bulk of cashew nut shell liquid for the war industries, normally affords employment for some 90 to 100 thousand persons who derive a substantial share of their annual income from employment in the industry. It is estimated that approximately half of the value of the cashew nuts harvested goes to the agricultural laborer for collection of the nuts (1). Factory wages for women workers are equivalent to only about 8 cents (United States currency) per day and for specially skilled men workers about 15 cents per day (United States currency).

The chief manufacturing plants in India are in Travancore State and the Madras Presidency, although some processing is done in Bombay, Portuguese India, and a few other areas. The chief manufacturing center of Travancore State is Quillon and Mangalore is the center of the processing in the Madras Presidency. Some 50 processing plants located in Travancore State, vary in size from those employing 100 persons to those employing more than 2,000 persons. It is estimated that some 60,000 workers are employed in the cashew nut industry in Travancore State. The output from these factories is normally valued at some 8 million Indian rupees or somewhat less than 2½ million dollars in United States value (1944 average rates of exchange value).

Madras factories normally process around 32,000 long tons of raw nuts and employ about 25,000 workers. There are approximately 50 factories operating in the Madras Presidency, but most of these are of the more primitive types, only 4 of them reported as using modern equipment. 13/ 14/

No definite information is available as to the size and processing facilities in other countries. Recent experiments in mechanizing the industry in Brazil, and substituting machinery for much of the hand labor formerly employed, are reported to have been successful. Some indication of the success of these efforts may be apparent in the arrival in the United States during 1944 of some 462,357 pounds of the blanched kernels from Brazil valued at $230,322, in addition to nearly 1,000,000 pounds of the cashew shell liquid. Should the mechanization of the industry in Brazil prove feasible, the tropical and subtropical areas possessing the natural advantage of an abundance of raw materials from their native forests might offer effective competition to the Indian cashew nut industry.

Tariffs and Trade Regulations

Possibly the most important regulations affecting international trade in cashew nuts and their products are the United States tariff or

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13/ See footnote 6, p. 4.

14/ See footnote 7, p. 4.

import duty of 2 cents per pound on cashew kernels imported into the United States and the British Indian standard rate of duty of 36 per cent ad valorem on raw cashew nuts imported from foreign countries outside the British Commonwealth of Nations, the latter being based upon a fixed tariff value of 39 rupees per 112 pounds equivalent at 1944 exchange value to about 10⅔ cents per pound. India also maintains a preferential duty of 24 per cent ad valorem on raw cashew nuts imported from a British colony and of 12 per cent on imports of raw cashew nuts from Burma. 15/

Following the outbreak of the Second World War and the resulting interruption to international trade, various wartime restrictions and regulations affecting the cashew nut industry have been put into effect. 16/ The duty on imports of cashew kernels into the United States has remained unchanged through the wartime emergency at 2 cents per pound as fixed under the Tariff Act of 1930 (paragraph 761) (13). However, cashew nut kernels and the cashew nut shell liquid, an important strategic material during the emergency, became subject to the General Imports Order of the War Production Board, M-63, issued December 27, 1941. Under the General Preference Order WPB M-66 of January 13, 1942, civilian use of cashew nut shell liquid was placed under Federal regulation and restriction and available supplies were allocated only among certain claimants, mainly for military needs. By Executive Order No. 9280 of December 5, 1942, control and allocation of supplies of these products were transferred to the War Food Administration, and WPB Order M-66 was superseded by Food Distribution Order No. 36 issued by the Secretary of Agriculture March 19, 1943, and which, although making no major changes in the regulations and restrictions governing allocation of supply, required prior authorization by the Director of Distribution of the War Food Administration for any delivery, acceptance of delivery, or use of cashew nut shell liquid, except for certain designated permitted uses. The purpose of these orders, restricting use and regulating trade in cashew nut shell liquid, was to conserve the limited available supplies for most essential requirements. These regulations remained in effect until the issuance of Amendment 1 to the F. D. Order No. 36, January 7, 1944, which amendment suspended temporarily the restrictions on use and delivery of cashew nut shell liquid for the period January 1, 1944, through June 30, 1944. On May 8, 1944, War Food Order No. 36 (8 F.R. 3480, 9 F.R. 367, 4319) was revoked and terminated. Revocation of the order was possible because of improvement in ocean-shipping conditions, as a result of which sufficient supplies of the liquid had been

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15/ United States Bureau of Foreign and Domestic Commerce. Private communication.

16/ Ketcham, John B. Control scheme for the certification and shipment of cashew kernels. United States Department of State, Foreign Service, voluntary report No. 19493. 4 pp. July 16, 1942. (Unpublished.)

accumulated to provide for prospective essential requirements and prospects for further imports appeared favorable.

In administering these orders and to assure sufficient supplies of the strategic war material, cashew nut shell liquid, imports of cashew kernels were linked to imports and availability of cashew nut shell liquid. Effective May 12, 1942, imports of kernels were prohibited, unless certification was given that liquid from the shells of the nuts had been extracted and made available to the United States. It was also provided at this time, that cases of ready-packed kernels already in possession of shippers but not yet shipped to the United States on May 12, 1942, and from the shells of which no liquid (oil) had been extracted, would be known as "uncertified kernels," and shippers would be permitted to ship half of their ready-packed stocks, estimated to total about 40,000 cases of 50 pounds each, net weight of kernels, or roughly 2,000,000 pounds, without accompanying them with an equal quantity of "certified kernels." The other half, 20,000 cases or around 1,000,000 pounds, was required to be accompanied by an equal quantity of "certified kernels" or those from the shells of which the oil had been extracted and made available to the United States.

To assure essential supplies of cashew nut shell liquid, the United States Government contracted to purchase approximately 1,550 long tons of the liquid at $475.00 per long ton, a price believed to be sufficient to enable extractors of oil to pay the shippers of India supplying raw cashew nuts for liquid extraction a price of rupees 7-8-0, or about $2.25 per bag of 168 pounds for the right to extract the liquid, the nuts to be subsequently returned to their owners for processing the kernels for export shipments. This payment was to be indirectly recoverable by the United States Government through collection by the Commodity Credit Corporation of the War Food Administration from importers of 7 cents per pound on the "certified kernels" imported into the United States, the 7 cents representing the difference between the purchase and sales price of the products by the Commodity Credit Corporation. Kernels were to be certified at the rate of 2½ pounds of kernels for each pound of liquid but on the average only about 1.6 pounds of kernels for each pound of liquid were certified. The Government of India stipulated that the first commitment under the new arrangement would expire on September 30, 1942, after which new arrangements would be worked out by the various interested parties regarding future purchases of cashew nut shell liquid.

This first program for the procurement of cashew nut shell liquid was completed and in November 1942, the second program for procurement of cashew nut shell liquid was introduced. Under this program, the Commodity Credit Corporation paid $250.00 per long ton for the shell liquid without respect to kernels, for which no shipping space was available. In September 1943, the third program was instituted. Under this, the shell liquid was purchased at $250.00 per ton, while the kernels produced in conjunction with the liquid were certified and permitted import into

the United States, on the basis of 1 pound of kernels for each pound of liquid produced. 17/ Although the Commodity Credit Corporation directly controlled purchase of cashew nut shell liquid, the kernels were permitted to be sold on a free market. Shipping space was provided for these kernels and for a certain quantity of cashew nut kernels produced under the earlier 1942 program, but not shipped during 1942. Importers continued to pay to the Commodity Credit Corporation the 7 cents per pound differential between the purchase and sales price which was payable, in addition to the regular 2 cents per pound tariff rate on imports of kernels. On some of the shipments of 1942 kernels. Commodity Credit Corporation also received the difference between its fixed purchase price of 50 cents per pound and the current New York market value. These receipts were designed to reduce the cost of the liquid purchased by the Commodity Credit Corporation to approximately the sales value of the liquid in the United States under the Office of Price Administration ceiling price. Cashew nut kernels were removed from the General Imports Order M-63, May 27, 1944, and cashew nut shell liquid was removed June 29, 1944.

Following completion of the Commodity Credit Corporation program for procuring cashew nut shell oil and the delinking of supplies of kernels from actual shipments of cashew nut shell liquid, the importation of both cashew nut kernels and cashew nut shell liquid into the United States by private interests was once again subject only to payment of the standard rate of duty and the ocean shipping restrictions on nonpriority cargo.

During the period of intervention of the United States Government with respect to the British Indian cashew nut industry and production and trade in cashew nut products the following quantities of the designated products were purchased by the Commodity Credit Corporation:

United States: Purchases of cashew nut products, 1942-44.

Year	Cashew nut kernels		Cashew nut shell liquid	
	Quantity	Estimated cost c.& f., New York	Quantity	Estimated cost c.& f., New York
	Long tons	Dollars	Long tons	Dollars
1942	2,000	1,320,000	1,450	770,000
1943	4,000	4,500,000	2,725	850,000
1944	1,600	1,900,000	1,680	520,000
Total (3 years)	7,600	7,720,000	5,855	2,140,000

17/ Subsequently the Commodity Credit Corporation agreed to certify an additional 1/2 pound of kernels for each pound of liquid produced. Such "supplementary certified" kernels were sold to Commodity Credit Corporation at 50 cents per pound and resold to importers at the New York market price on the day of the purchase.

Ranking next to the United States operations and dealings in cashew nut products during the emergency as a factor affecting the industry was the ban or prohibition on British Indian imports of raw or unshelled cashew nuts from Mozambique in April, 1943. This prohibition remained in effect through 1943 and 1944. Public notice No. 699 issued January 19, 1945 by the Deputy Chief Controller of Imports, Bombay, stated that licenses for the import of a limited quantity of raw cashew nuts from Mozambique will be issued for the period January-June, 1945. Dealers, however, reported in early February, 1945, that on account of the continued scarcity of shipping space no business had transpired and no licenses for imports had been issued. 18/ 19/

The British Government, except to the extent that no duty is levied on imports of cashew nut kernels or cashew nut shell liquid into the United Kingdom, has not formally intervened in the situation affecting the cashew nut industry of India. Purchases of cashew kernels by the British Food Mission during 1943, however, were a strengthening factor in the market, particularly during the months preceding the announcement that effective September 1, 1943, the United States Commodity Credit Corporation would arrange for shipping space to be allotted to "certified, oil-processed kernels," to the United States. 18/

Cashew nuts imported into Canada are grouped with "nuts, shelled, not otherwise provided for". Under the Canadian Tariff Act, four rates of duty are applied to imports into Canada. The rates applied to cashew kernels are: The Preferential rate of 3 cents per pound applied to imports from countries or areas included in the British Commonwealth of Nations; the Most-Favored-Nations rate of 2 cents per pound applicable on imports from countries having commercial agreements with Canada that entitles them to Most-Favored-Nation treatment in the application of duties; an intermediate rate of 3½ cents per pound applicable to countries having commercial agreements entitling them to this rate of duty and a standard rate of 4 cents per pound on imports from all countries not included in the other classes previously mentioned. In actual practice, the intermediate and standard rates are seldom, if ever, applied to cashew kernel imports. Imports of cashew nut shell liquid into Canada are free of duty.

Principal Consuming Areas

The United States is by far the most important consumer of cashew kernels in the world. No definite statistics of actual annual consumption of cashew kernels in the United States are available but since all of the supplies are imported, the official data of imports into the United States, allowing for a small export trade, afford a fairly reliable measure of consumption in the United States. These import data indicate that more

18/ Feld, Nicholas. The Indian cashew nut industry, year ended, August 31, 1943. United States Department of State, Foreign Service, report No. 96. 7 pp. September 23, 1943. (Unpublished.)

19/ Adair, Charles W., Jr. The Indian cashew nut industry. United States Department of State, Foreign Service, report No. 26. 3 pp. February 12, 1945. (Unpublished.)

than three-fourths of the total British Indian production of cashew kernels are shipped to the United States and only a very small part of these shipments are reexported--these mainly to Canada. Formerly, it was estimated that maximum consumption of cashew kernels in the United States would not exceed 25,000,000 pounds annually (1). During 1941, however, official import data show imports of some 36,000,000 pounds, most of which were retained within the country for domestic consumption. Most of the consumption of cashew kernels in the United States is in the form of salted kernels. Utilization of cashew nuts in the production of candy or confectionery in 1942 was estimated at 2,137,000 pounds from an estimated total consumption of some 18,000,000 pounds, or roughly 12 per cent. Small amounts are also used in bakery or ice cream products but no definite estimates of these quantities are available. 20/

The United Kingdom, although it is the world's largest importer of foodstuffs and notwithstanding the recognized high nutritive value of the Indian cashew nut kernels and the British policy of according preferential treatment to products of the British Commonwealth of Nations, has not in past years afforded an important market for these kernels. The quantities imported into the United Kingdom have not been sufficiently large to have been separately classified as such in their official statistical publications of imports. Exports of the Indian kernels included in the Indian export statistics show shipments destined to the United Kingdom in pre-war years for which data are available covering only around 1,500,000 pounds, or approximately 6 per cent of the Indian exports. Recent sizable purchases of cashew kernels by the British Ministry of Food and greater emphasis on the nutritive value of foodstuffs during the war years may serve to stimulate increased consumption in the United Kingdom during the post-war years.

Canada substantially increased imports of cashew kernels in 1941, with imports from India reaching the record quantity of 2,706,000 pounds or more than double those of a year earlier. Imports in 1942 were nearly as large but arrivals in 1943 and 1944 were sharply lower, probably because of lack of available shipping space for non-priority cargo. Other members of the British Commonwealth of Nations absorbing a share of the Indian exports of kernels include the Union of South Africa, Australia, and New Zealand.

Among the continental European countries France, Netherlands, and Belgium are the largest consumers of cashew kernels. For the most part, these nuts are utilized in the European countries as salted nut kernels much in the same way as they are used in the United States. There is perhaps a larger part of the total consumption of kernels accounted for through use of the broken kernels in baking and confectionery than in the

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20/ United States Bureau of Foreign and Domestic Commerce. Private communication.

United States. Pieces of cashew kernels are normally in active request at Amsterdam (the Netherlands) for use in biscuits and confectionery.

Domestic consumption of kernels in India during the pre-war years was relatively unimportant. On the whole, small producers were desirous of disposing of practically all of the nuts harvested. Children occasionally consumed small quantities of nuts and a few well-to-do landlords retained small quantities of cashew nuts for their own use. The total quantity thus retained for home consumption by producers is estimated as not in excess of 2 or 3 per cent of the total production. Restaurants provide the media through which the largest quantity of cashew kernels are consumed in India. A number of dishes and sweet meats are prepared and served daily with cashew kernels as an ingredient. Smaller quantities sold are mixed with peanuts, peas and other pulses, fried in "ghee" (liquid butter) with salt, in a form similar to our salted nuts, or in candy stores thickly coated with sugar.

During the war years, when shipping space for kernels for export has been limited, strenuous efforts have been made to dispose of as many kernels as possible in India. During the years 1943 and 1944, however, it has been estimated that not more than 75,000 to 100,000 bags, of 50 pounds net each, were sold for domestic consumption. Although this quantity was much greater than in normal pre-war years, it is reported that Indian merchants expect cashew kernels to remain primarily an export commodity. This assumption is based upon the fact that prices offered by foreign importers have always been more attractive than can be obtained in India, also because western countries offered a larger volume of trade due to the greater variety of uses of the kernels there as well as to differences in diet between the East and West.

The increased utilization of cashew kernels during the war years, particularly in the Bombay area, is attributed in part to the presence of a large number of troops, war workers, and the influx of native population into Bombay, together with the general dislocation in normal industrial activity and the inflationary tendency in the country as a whole. During 1944, domestic demand at Bombay continued well above average but dealings of merchants were restricted by the Bombay government which held that cashew kernels were classifiable as a foodstuff, the export of which was prohibited without a permit and therefore it was reluctant to permit exports to other parts of India. 21/

In the producing areas of South America or Africa, consumption of cashew nut kernels is relatively small. Only small amounts of ker-

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21/ Bower, Roy E. B. The Indian cashew nut industry, year ended, August 31, 1944. United States Department of State, Foreign Service, report No. 116. 9 pp. November 16, 1944. (Unpublished.)

nels are consumed locally in the African producing areas. In Brazil and other tropical or subtropical areas of America, no substantial quantities of the kernels are consumed by the native populations who prize the "apple" more highly as an article of food than the kernels (11).

Considering the high nutritive value of the kernels a wider distribution of consuming areas through further expansion of international trade and increased utilization in important producing areas would appear to be most desirable. Chemical analysis of the kernels of good-quality nuts shows the following constituents: Moisture 5.0 per cent, protein 19.1 per cent, fat 47.1 per cent, carbohydrates including crude fiber 26.2 per cent, and ash 2.6 per cent (14). So far as is known, there is no commercial extraction of the oil from the kernels, although experiments have shown a yield of 40 per cent of a yellow bland oil which can be substituted for almond oil. The nuts compare favorably with almonds and walnuts in nutritive value. Some authorities regard cashew nuts as superior to almonds in their digestibility coefficient and biological value. Their nutritive value is also reported to be further enhanced by the presence of the vitamins A and B_2. 22/

Harvesting: Methods and Costs

Since the flowering period of the cashew trees lasts for some $2\frac{1}{2}$ to 3 months, the time during which the nuts mature and ripen for harvest extends over practically the same period. Since the nuts ripen irregularly, this necessitates picking of the fruits from the same tree a number of times during the season.

In India, nuts are picked by native workers, who use a long bamboo pole with a hook on the end, with which the ripe fruits are pulled down one by one. In actual practice, many unripe nuts are gathered along with the ripe ones as a result of carelessness in striking the branches with sticks. Separation of the nuts from the "apple" which remains attached, is the first operation in preparation of the nuts for processing. The unripe nuts are then sorted out and separated from the ripe nuts, although the unripe nuts may later be dried and mixed with the riper nuts. This usually completes the work done by small dealers or producers.

The main work of the wholesaler or large dealer consists of drying and removal of immature or poor-quality nuts. These operations usually result in a loss of around 10 per cent in weight of the product.22/

Preparation for market involves several principal operations--roasting, shelling, blanching, grading, and packing. Since discovery of the importance of the cashew nut shell liquid in certain industrial

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22/ See footnote 6, p. 4.

uses, much attention has been given to improving methods of roasting in order to obtain the maximum extraction of good-quality nut shell liquid. The roasting process through which the blanched nuts for market are prepared has undergone several stages of development. In the smaller factories or processing plants, which still constitute a large part of the Indian establishments, the primitive method of open roasting is still in use. This consists of placing 2 or 3 pounds of raw nuts in shallow semicircular iron or earthenware vessels over an open fire. Within a few minutes after the nuts have come into contact with the hot surface of the vessel and the surrounding flames, part of the oil from the nut shell is released and catches fire, also causing the shells to burn. Highly skilled operators lift the pan with the burning nuts and tilt the contents onto the ground where the flames are quenched by throwing sand or cold ashes on them. This method results in loss of a high percentage of the valuable nut shell liquid, and the heavy and highly pungent smoke from the burning nuts which hangs about the place may be seriously injurious to the workmen. Health regulations, therefore, prohibit open roasting of nuts within municipal limits.

In 1930, a British firm designed and patented a special roaster, consisting chiefly of a rotary iron cylinder built into a furnace and provided with a suitable chimney. Nuts are passed through the cylinder, which is preheated with burning shells and the fumes are conveyed outside through the chimney without causing much discomfort to the workers. Soon after the nuts catch fire, they reach the delivery end of the cylinder where the flame is extinguished by a spray of water and the nuts are cooled and shelled. Burning of the nuts renders them brittle and easily shelled so that whole kernels may be obtained with a resulting reduction in the percentages of loss through breakage. This process is reasonably efficient insofar as the kernels are concerned but it has the disadvantage of the loss of much of the valuable nut shell liquid, which is more or less burned away.

A third method consists of utilizing a machine for dipping the nuts kept in wire trays in a bath of oil or molten metal, for a short time, or until the nuts are properly roasted, the oil or molten metal being maintained at a temperature of 150 to 200° C. The nuts are then taken out of the bath and when cooled are put through the subsequent processes of shelling, etc. Some of these machines are designed to yield the maximum quantity of good-quality kernels, while recovery of a high percentage of oil is the main object of other types. Although roasting is the commonest method of curing the nuts in the most factories, two of the processing centers in the Madras Presidency do no roasting at all, the nuts being thoroughly sun-dried instead.

Following completion of the roasting process, the shells are removed, usually by women workers who break the shells gently with light wooden mallets and remove the kernels. The kernels, when removed

from the husks, are covered by a mottled tough skin. This must be removed before the kernels can be packed for export. To facilitate removal of the skin, the kernels are heated on open trays in specifically constructed ovens or air chambers where they are kept at a temperature of 70° F., for 6 to 8 hours, or at 100° F., for 4 hours. In some instances, they are dried in the sun which operation requires a correspondingly longer period of time. 23/ 24/

After the heating or drying period, the kernels are entrusted to women workers who usually take them home to remove the skins. These workers are required to return the full weight, in the form of whole kernels, their broken pieces and the pieces of the skin.

The blanched kernels, as they are received after removal of the outer skin, are very brittle and liable to be easily damaged by the further process of grading and packing. They are, therefore, allowed to absorb moisture for 2 or 3 hours by placing the kernels on trays or racks in cool rooms in moist atmosphere, or they are sprinkled lightly with water.

Comparison of the costs of processing in various areas shows more or less uniform rates of expense for the various items of cost in curing, grading, or packing of nuts for shipment.

The following estimates represent a fair average of the costs of preparation of kernels in the Madras Presidency for a bag of cashew nuts (unshelled) weighing 165 pounds:

Item	Equivalent United States Value Cents
Roasting	7.53
Shelling (4 pies per pound kernels)	24.47
Peeling (4 pies per pound "wholes") (2 pies per pound "brokens")	22.59
Grading	4.70
Miscellaneous--warming, moistening, packing, etc.	31.06
Total Cost.....	90.35

Little information is available regarding harvesting methods or costs in other areas. In Portuguese East Africa, natives gather the nuts and bring them to local collective points where they are purchased by dealers. These dealers are nearly always British Indians who, until recently, had a practical monopoly of the trade. The unshelled nuts are sorted, placed in bags, and sent to the port of Mozambique and other principal ports for export.

23/ See footnote 6, p. 4.

24/ See footnote 7, p. 4.

Figure 3.- Shelling and processing nuts.

Grades and Standardization

Cashew nuts (unhusked) are not graded by growers, contractors, wholesalers, or retailers. Despite the absence of formal grade designation, dealers to some extent reoognize variation in size and superior quality of nuts coming from a certain area as compared with those from other areas, with the result that the larger, better quality nuts characteristic of certain areas are marketed more readily or at slight premiums in price over those coming from other areas. In general, Indian nuts are believed to be superior in size and quality to the African nuts. As compared with the Indian nuts, African nuts are said to show greater variations in size and to contain a higher percentage of small, immature, and shriveled nuts than the Indian. The liquid (oil) content of the African cashew nut shell is generally lower than that of the Indian nuts and this is reported to result in a higher percentage of breakage of kernels during processing and shipment.

Local manufacturers sort and grade the kernels according to grades and standards specified by American buyers. Kernels intended for export to the United States market are graded strictly and packed and labeled according to the recommendations of the buyers. For export to other areas the manufacturers may use their own standards or grade designations.

Most of the grading work is done by hand labor. Experienced women workers are usually employed for this work and are paid at a rate equivalent to $7\frac{1}{2}$ cents per day, United States currency, at 1944 annual average exchange value. When the work is given out on contract, as it is in some instances, workers are paid at a rate equivalent to $8\frac{1}{2}$ to $9\frac{1}{2}$ United States cents per 100 pounds of kernels graded. A higher rate equivalent to $9\frac{1}{2}$ to $11\frac{1}{2}$ United States cents per 100 pounds of kernels is normally paid for grading kernels from African nuts, which are generally smaller in size than the kernels from Indian nuts and therefore require more time for grading.

Kernels intended for export for the United States trade must be fully developed, ivory white in color, and free from insect damage and black and brown spots. Under the provisions of the United States Federal Food, Drug, and Cosmetic Act and the general regulations for its enforcement, the percentage of deteriorated or unsound kernels permitted in imports of cashew kernels into the United States is 5 per cent, and all the other general provisions of the act as they pertain to sanitary conditions and fitness for human food are strictly enforced (3).

The United States trade has, in general, accepted certain grade specifications, and prices on purchases and sales are determined in accordance with these specifications.

Cashew kernels: United States grade specifications 25/

Grade designation	Trade name	Number of kernels per pound
A	"Jumbo"	210
B	"Extra Fancy"	240
C	"Fancy"	280
CD	"Rajas"	320
D	"Standard"	370-400
DD	"Second American"	500

American grades for broken kernels

Grade designations	Trade name	Description of quality
H	Butts	Half kernels, broken crosswise
J	Splits	Half kernels, broken lengthwise
K	Fancy broken	Big pieces
L	Standard broken	Medium pieces
M	Grinding stock	Very small pieces

Pieces of H and J grades can be separated out easily, but for sorting K, L, and M grades suitable sieves are used.

Kernels which are slightly yellowish in color or are slightly shriveled are classedas "P" grade and are generally marketed in India or exported to Europe.

The percentage of kernels to nuts is 25 to 30 per cent by weight, and of the seed coat or skin to kernels 10 per cent. The proportion of "Brokens" to "Wholes" is 10 to 90 per cent.

25/ See footnote 7, p. 4.

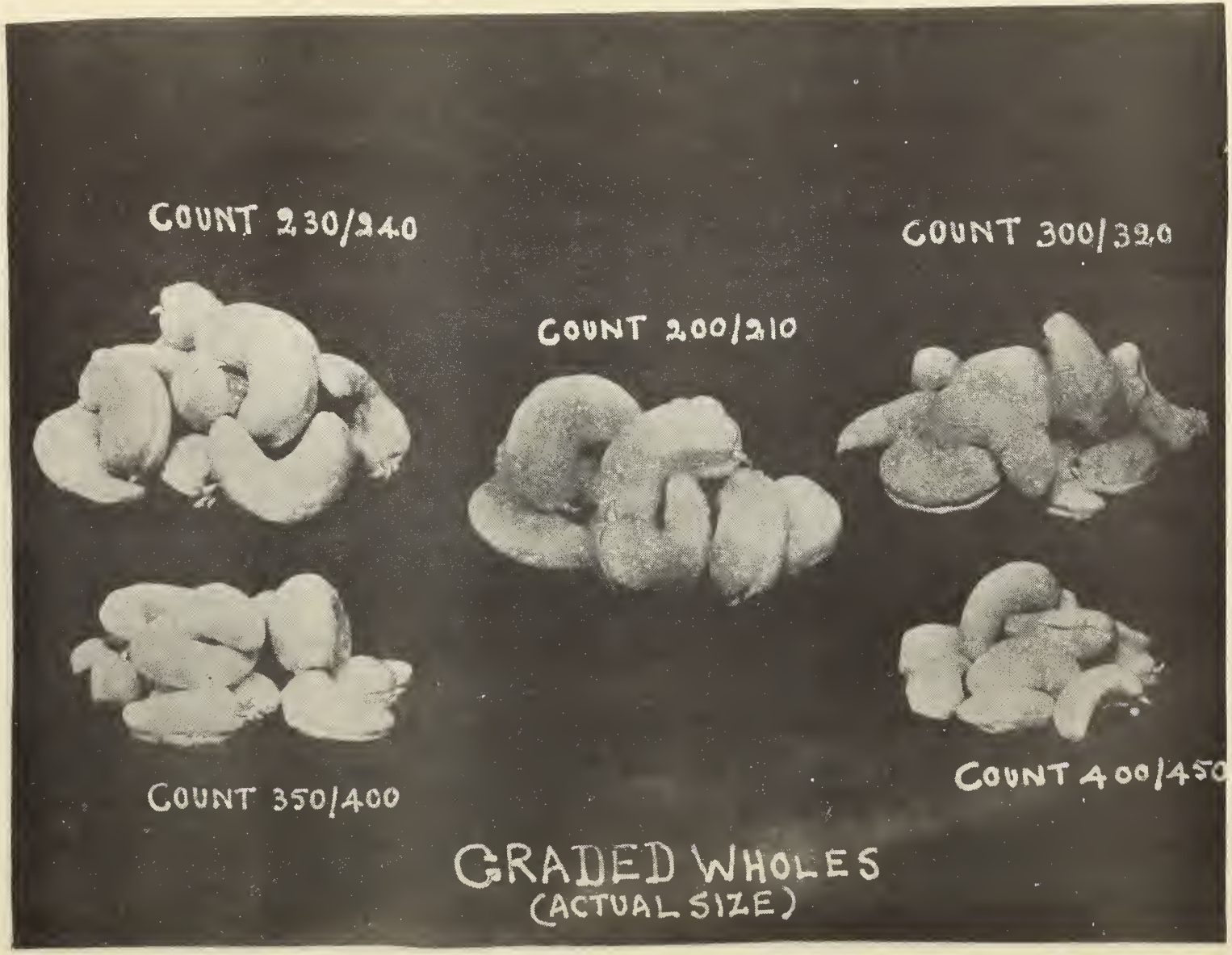

Figure 4.- Standard grades of cashew kernels

Packing, Containers, Materials and Costs

Jute bags are commonly used for packing raw nuts. The weight of one empty bag is about 2½ pounds, and when filled with nuts the weight varies from 130 to 196 pounds. The unit of packing intended for transport by rail is 2 railway maunds (82-2/7 pounds each), including the weight of the bag. Wholesalers who supply nuts to factories in candies (700 pounds) arrange to fill in one-fourth of a candy or about 175 pounds in each bag. Jute bags appear to be satisfactory for packing raw nuts as the kernels are well protected in their natural shell against weather damage or insect infestation. 26/ 27/

The commonest containers for packing cashew kernels are 4 gallon cans of the types used for kerosene oil. The weight of the empty can is approximately 1½ pounds. These cans are finally enclosed in a light wooden case for export. The cases measure 21 by 15 by 12 inches. An empty case weighs from 5 to 7 pounds according to the wood used.

In pre-war years, only new cans were used for packing kernels for shipment to the United States. These cans were generally purchased from the kerosene companies and imported from Bombay or Goa. One of the factories at Vengurla, however, manufactured cans locally for packing the kernels. Second-hand cans were used for packing kernels for marketing in India or for export to countries other than the United States. The price of new cans in normal pre-war years fluctuated from around $16.57 to $19.58 per 100 cans or 16½ to 20 cents a piece. Second-hand cans, suitable for use in pre-war years, were generally available at the equivalent United States value of 7½ to 9½ cents each.

In packing, 25 pounds of cashew kernels are placed in each can and the bunk is soldered. Partial vacuum is then created by use of a hand pump to extract air through a small opening. Carbon-dioxide, from steel cylinders, is then injected through another small opening, after which both openings are sealed. This process is known as the "Vitapack" process of packing. The cans are enclosed in wooden cases (2 cans to each case) for export. The cases are brought in from Cochin or Malabar. Their normal pre-war price was equivalent to about $9.64, United States currency, per hundred cases.

The labels supplied by buyers from the United States are pasted on cans which are to be dispatched to this country. For export to other destinations, the manufacturers use their own labels. The gross weight of each can is 27½ pounds and the weight of each case (containing 2 cans) is about 65 pounds.

For distribution in India, cashew kernels are also packed loose in wooden cases. Usually 112 pounds of kernels are enclosed in each case.

26/ See footnote 6, p. 4.

27/ See footnote 7, p. 4.

Costs of Packing

Item	Equivalent United States Value 28/ Cents
Cost of packing cases with 2 cans	
Cost of 2 cans	34-38
Cost of case	9-11
Labor charges	2- 4
Total packing charges	45-53
Cost of packing one hundredweight (112 pounds) case	
Cost of case	30-37
Oil paper and labor charges	4- 4
Total packing charges	34-41

Storage Conditions and Effects of Storage

Storage of cashew nuts by the small cultivators usually is only a temporary arrangement for a period not exceeding from 7 to 10 days and consisting of collections for a week or 10 days accumulated to be sold as one lot. Large producers, relatively few in number, processors, wholesalers, etc., store their produce in jute bags and keep them in any available space. Factory owners are the only persons who own special warehouses known as "godowns" for storage of raw nuts.

Factories which have to stock raw nuts for continuous processing are provided with warehouses. In these, a year's supply is purchased and stocked soon after the harvest. Part of the space is used for storing packing material. The cost of storage may be roughly estimated for a long ton of raw nuts on the basis of the rental value, etc., as detailed below:

	Equivalent United States Value 28/ Cents
Rental value	30
Supervision	5
Insurance	10
Total.....	45

Shrinkage in storage is estimated to range from 2 to 5 per cent of the original weight.

Except in the large factories, facilities for storing raw nuts are inadequate. Since the nuts are inflammable, it is considered essential that they be stored in protected warehouses with fireproof roofing.

28/ See footnote 6, p. 4.

All ports have warehouses for storing goods where a small percentage of the value of the goods is charged as a warehouse fee. All important ports also are provided with bonded warehouses.

In some areas, banks or cooperative societies provide storage for raw nuts which are offered as security for "key loans." These loans for 50 to 75 per cent of the value of the raw nuts provide revolving capital with which manufacturers cover further stocks of raw nuts in the markets while manufacturing for export.

Transportation, Port, and Handling Charges

Most of the inland traffic from producing areas to factories or primary assembling centers is by local hauling except for distances of more than 50 miles when the nuts may be shipped by rail. Finished products from factories intended for foreign consumption are exported by steamer, while kernels meant for local consumption are mainly shipped by rail.

As previously noted, kernels intended for the export trade are packed in 4-gallon cans, two to the wooden case. Freight rates on these cases for ocean shipping are charged by the cargo ton of 50 cubic feet, made up of about 24 packages. Freight rates normally differ with the length of the haul. The principal exporting port for cashew kernels is Cochin, and rates of freight on cashew nut exports to certain foreign ports, at the end of 1940, were as follows:

		Equivalent United States Value Cents 29/
Commodity	Cashew kernels	
Packages	Cases	
Shipping	50 cubic feet	
London, Liverpool, Marseilles		14.68
Harve, Dunkirk		15.96
New York, Boston, Baltimore, Philadelphia		14.94

These rates represented an increase of 33-1/3 per cent for the United Kingdom and continental ports over the pre-war rates.

29/ See footnote 6, p. 4.

Port and other charges on the 24 cases were as follows:

	Equivalent United States Value Cents 30/
Hauling from warehouse to harbor	90
Harbor dues	105
Forms and stamps	64
Removing and loading charges	23
Sundries for shipment	23
Agency commission	90
Total.....	395

The customs export duty is 1/2 per cent of the invoice value.

Ocean Freight Rates

Ocean freight rates on cashew nuts and cashew nut products have, in general, fluctuated with trends in rates on other cargo. Following the outbreak of hostilities in 1939, and the resulting interruption to ocean shipping, rates on all ocean shipping advanced sharply and at the end of 1940 freights quoted on cashew kernels from Indian ports to British, French, and American ports were approximately 33-1/3 per cent above pre-war levels.

Throughout most of 1941 the shipping situation remained acute. At the end of March 1941, ocean freight rates on kernels from South Indian ports to United States ports were quoted at $28.25 per cargo ton of 50 cubic feet, representing space for 24 cases, each case containing 2 cans of 25 pounds net weight of kernels or 50 pounds net weight of kernels per case. While freights were quotable at $28.25 per shipping ton, freights on chartered vessels were at the rate of $58.89, and in June 1941, the rates on chartered vessels necessary to lift goods had increased to $75.00 per shipping ton. The lack of available shipping space considerably retarded factory operations during the first half of 1941, and at the end of June a considerable portion of the contracts for shipment of kernels to the United States during January-June was unfilled. The situation continued critical throughout the remainder of 1941, the importers of raw nuts from Africa being reluctant to make future commitments except on firm orders from processors, and factories being disinclined to commit themselves on any substantial purchases in view of the uncertainties with respect to the shipping situation for movement of kernels or other products from Indian to United States ports. 30/ 31/

30/ See footnote 6, p. 4.

31/ Feld, Nicholas. The Indian cashew nut industry, year ended, August 31, 1942. United States Department of State, Foreign Service, required report No. 27555. 22 pp. October 3, 1942

Effective January 20, 1942, the United States War Shipping Administration took action to "roll back" ocean shipping costs for the movement of cashew nut products from Indian to United States ports to the September 1, 1940, level, and established a rate of $20.00 per shipping ton of 40 cubic feet for kernels in cases of 50 pounds net weight. On the basis of an average of 20 cases per shipping ton of 40 cubic feet, this rate would represent a freight charge of about 2 cents per pound of kernels. In addition to this basic rate, a surcharge of 40 per cent was provided. The basic rate of approximately 2 cents per pound has remained unchanged to date (June 1, 1945) but effective December 28, 1943, the surcharge was reduced to 25 per cent, a reduction still in effect June 1, 1945.

The ocean freight rate on cashew nut shell liquid, in drums of various sizes, from Indian to United States ports, was established by the War Shipping Administration, effective as of January 20, 1942, as $25.00 per 14 British hundredweight of 112 pounds, or about 1.6 cents per pound, with a surcharge of 40 per cent. The basic rate has remained unchanged to date (June 1, 1945). The surcharge, however, was reduced to 25 per cent effective December 28, 1943, and has remained unchanged to date (June 1, 1945).

Effective May 18, 1945, the War Shipping Administration established on inedible raw cashew nuts, reported to be worth $48.00 per long ton, shipping rates from African to United States ports. Those from the Portuguese East African ports were: from Laurenço Marques, $12.00 per long ton, and from Beira, $14.00 per long ton. From British East African ports, the rate was $16.00 per long ton. In addition to these rates, a surcharge of 30 per cent was applicable to shipments over each of the designated routes. 32/

Price Trends Determined by American Demand

Few statistical data are available to indicate the trend of prices of cashew nuts or kernels in either producing or importing areas. In India, in rare cases, records are retained by cashew nut producers of prices received for their products. These data, however, are scattered and not sufficiently complete or continuous to afford a reliable and representative price series. Since there are no official grade standards showing the quality of the raw nuts, such records as are available from producers show little change in seasonal prices.

Prices paid in India or received by growers are, for the most part, based upon prices in the United States market. Current price

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32/ United States War Shipping Administration. Private communication.

information from the United States under normal conditions is received by air mail each week by Indian factory owners. Before closing contracts, agents of the Indian factory owners, located in the United States, cable current prices and market comment of this country. But no information regarding stocks in the United States or other foreign markets is made available to the Indian factory owners. The agents of the Indian factory owners in the United States charge 2 to 3 per cent of the cost of the goods supplied as commission for their services, but no charge is made against the factory owner for expenses incurred for cables or in the settlement of contracts.

Bombay merchants are generally well informed as to the market situation for raw nuts in East Africa as most of them maintain their own shops in Africa. Here contracts for local factory owners are made for further deliveries, usually through local dealers who charge a commission of 1 per cent of the value of the material. Wholesale prices are generally determined after receipt of quotations cabled by foreign agents. As most of the important transactions are effected through contracts, daily fluctuations are of little market significance. Prices of African nuts are generally quoted for metric tons or for bags of 80 kilos net or 81 kilos gross. Shrinkage of 3 to 4 pounds per bag per day is frequently reported. Most transactions allow $2\frac{1}{2}$ pounds per bag for shrinkage.

During the early years in the history of the industry, price trends were downward (Table 10). This downward trend resulted largely from the expansion of the industry and increased offerings of cashew kernels in world markets (1). During the years 1929-31, prices of cashew kernels held fairly stable with the annual average price at 150 shillings per British hundredweight of 112 pounds. However, the world financial crisis which culminated in the British suspension of the gold standard in September 1931 was immediately reflected in a generally unsettled market situation for all important commodities moving in international trade. Much of this trade had been financed in London and many contracts called for settlement in British currency. The market for cashew kernels, like those for other commodities, declined sharply and the average price for the year 1932 dropped to 70 shillings per hundredweight, or the equivalent of 11 cents per pound in American value. During 1933, the downward trend in prices was reversed and further gains during 1934, stimulated by the active United States demand, brought prices back to near normal levels. During the 5-year period immediately preceding the outbreak of hostilities in 1939, prices fluctuated within a wide range, equivalent in United States values to from 11 cents per pound to 20 cents per pound and averaging 18 cents per pound during these years. During this period, United States buyers advised Indian exporters that any rise in price above 100 shillings per 112 pounds or about $21\frac{1}{2}$ cents per pound, would contribute to a decline in demand for the cashew kernels in this country.

During the closing months of 1940, American buyers showed a tendency to change over from trading in British sterling and hundredweights to buying in United States weights and measures. Prior to this time most transactions had been done on the basis of British weights and currency, but the difficulty encountered in negotiation of sterling bills led Indian shippers to the conclusion that trading would be facilitated if transactions were based on the American weights and currency, provided adequate coverage of exchange could be obtained from local bankers. Through 1940 and until March 1941, prices of kernels remained relatively stable at around 17.75 cents per pound.

During March 1941, information reaching Indian processors indicated that shipping space for cashew kernels would be difficult to secure and that ocean freight rates for cashew kernels were being increased. Indian sellers sold heavily, so that by the middle of March 1941 roughly 75 per cent of the potential 1941 production was covered by forward sales. With local supplies of unsold kernels relatively light, and a continued active demand, prices increased sharply and by August 1941 prices were quoted at 30 cents per pound as compared with the price of 17.75 cents in March 1941. The upward trend continued through 1941 and at the end of September 1942 United States importers were offering 35 cents per pound for 320 count whole kernels, c. & f. New York. During the period of the intervention of the United States Government agencies in the cashew nut industry and the ban on imports of kernels, except in accordance with terms specified under the government plan, no representative United States importers prices were available. Nominal quotations for large, whole kernels during July and August 1943 ranged from 70 to 80 cents per pound. Sales during 1943 to the British Ministry of Food Mission in London were at a rate equivalent in United States value to about 17½ cents per pound f.o.b. Cochin, India. 33/

During September 1943, most of the cashew kernel shipments comprised kernels certified under the 1942 oil-kernel plan and allowed to be shipped during the year under review. These shipments were made at ceiling prices based on 50 cents per pound for 320 count wholes and 40 cents per pound for pieces, with standard differentials for other grades. Towards the end of September 1943, sales were made on free market terms at the equivalent of 55 to 60 cents per pound for 320 count wholes, and 42 to 44 cents per pound for broken. The highest c. & f. prices, New York basis, were 75 cents per pound for wholes 320 count, and 56 cents per pound for broken, during November and December 1943, when quotations were on a free market basis. Prices held near these high levels during the early part of 1944 but showed a downward trend from April through August. Quoted prices in exporting areas of India, however, continued their upward trend through the period January through August 1944, with quoted prices for export during August 1944 double those of a year earlier.

33/ See footnote 18, p. 15.

Wholesale prices in New York for the consuming trade have not fully reflected the variations paid to Indian dealers. In 1932 when Indian prices were sharply lower, wholesale prices in New York remained near previous levels. During the war years, prices have reflected the general instability prevailing in all commodity markets, particularly for those commodities moving in international trade. New York prices, which had remained near normal levels through 1939 and 1940, advanced sharply during the early months of 1941, following which the scarcity of shipping space drastically reduced the international movement. With the intervention of the United States Government into the cashew shell liquid situation, and imports prohibited except in accordance with the Government plan, trading on the free markets was suspended and no price quotations on whole kernels were available in the New York wholesale market during the latter part of 1941 and for the year 1942. In 1943 trading on the free market was resumed and prices advanced rapidly to establish the all-time record high monthly average of $1.02½ per pound for whole kernels for the month of June 1943. Throughout 1943 and 1944 prices have remained near these extraordinarily high levels of nearly four times pre-war values. 34/

Few statistics are available to indicate price trends in markets other than India and the United States. The export value of Portuguese East African nuts in 1941 averaged around $18.10 per ton of unshelled nuts. Prior to this date the peak year for prices was in 1937, when record exports of around 42,000 tons had an average value of $23.80 per ton. At the end of 1937 the actual selling price was reported as equal to about $30.00 per ton f.o.b. Lourenço Marques. This price advanced to $35.00 per ton in February 1938, and continued upward particularly after the outbreak of hostilities in 1939. Prices for East African nuts prior to World War II had been established by Bombay brokers. Following the outbreak of hostilities and the interruption to shipping, prices fluctuated widely, with one shipment to Bombay in January 1942 reported at $88.00 per ton and another at $100.00 per ton. No price quotations on unshelled nuts from Portuguese East Africa have been reported since the prohibition on imports into India became effective in April 1943.

Carry-over Stocks as of August 31

Under normal conditions of trade, carry-over stocks of nuts are of little significance as market factors. Supplies of domestic nuts are usually exhausted by late July or August and processors are dependent upon imported stocks from Mozambique to keep plants operating during the later months of the year and until the new Indian crop comes on the market during February to May of the succeeding year.

During the war years, however, interruption to the normal trade movement has resulted in some accumulations. While no official data are available, estimates by Indian trade authorities show the approximate

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34/ See footnote 21, p. 17.

quantities of supplies on hand at the end of the crop year August 31, for the years indicated:

India: Cashew nuts, carry-over stocks, August 31, 1941-44

Year	Unshelled (Pounds)	Shelled (Pounds)
1941	1/ 2,000,000	----
1942	20,160,000	4,500,000
1943	47,040,000	2,280,000
1944	46,200,000	2,500,000

1/ Stocks were reported very low, as a result of the large forward sales during the early months of 1941, which practically exhausted domestic supplies, and the ban on imports of raw nuts from East Africa from June 20, 1941, to July 18, 1941, which reduced imports of unshelled nuts from this area.

Market Outlook

Removal of the restrictions on United States imports of kernels suggests a resumption of the active United States demand for kernels when shipping space becomes available. Revival of the demand from other areas is also in prospect, particularly from other areas of the British Commonwealth of Nations.

One of the elements which may contribute to the expansion of world trade in kernels during the post-war years may be the increased interest in adequate diets resulting from war-time conditions and operations of the various food missions to provide more nutritive and more nearly adequate diets for their populations. The net result of operations of various governmental agencies during the emergency may be to stimulate demand for all highly nutritious foodstuffs, such as cashew kernels, and to provide a continually increasing international trade as well as increased domestic utilization in producing areas.

While the cashew nuts or kernels have heretofore been the primary product of the industry, as the industry becomes more highly organized, commercial production of other products may also be of increasing importance. The cashew shell liquid, previously noted as a strategic war material, may find expanding industrial uses resulting from further research.

This liquid is a dark viscous substance which, according to Joseph and Sudborough (Chem. Abs., 17, 1897 (1923)), contains a phenolic compound called "Cardol" (C_{32} H_{52} O_4) and an acid (C_{22} H_{32} O_3), which has been named anacardic acid. This liquid has an iodine number of 296, an

acid value of 107, a saponification value of 119, and a density at 20° C. of 1.0131. This so-called oil or liquid accounts for about 20 per cent of the weight of the shells (7).

It is estimated that about 90 per cent of the liquid represents the commercial "Cardanol" content or the monohydric phenol, which is the most important constituent (2, 15). Many patents have been issued covering methods for the manufacture of this liquid, equipment used, and uses of the commercial product for industrial purposes. It is used in various protective coatings, as a plasticizer for cellulose acetate lacquers, in the preparation of insecticides, and as a fixative in perfumes. These uses are sufficient to establish the commercial importance of this product, which is reportedly the most economical source of chemurgic phenols.

Production of kernel oil and kernel cake or meal similar to products of other raw materials used in production of vegetable oils would provide an additional market outlet for kernels should the application of machinery to processes formerly performed by hand labor greatly increase supplies of kernels for the world trade. So far as is known, there is at the present time no important commercial production of oil from cashew kernels.

The fruit of the cashew nut, commonly known as the "apple", may also be put to commercial use in production of fermented liquor or vinegar or as a foodstuff, preserved or otherwise processed (8, 11). 35/ From the economic viewpoint, production of industrial alcohol might seem to offer the greatest possibilities for utilization of this product.

Policy of the Indian Government

The cashew nut industry has developed mainly under the direction of private enterprise. The Indian Government; however, has shown some interest in the improvement of the products and the establishment of the industry on a plantation basis. There has been little, if anything, done during the war emergency to extend the controlled cultivation of cashew nut trees in India. It appears likely that there may be a greater trend towards cultivation of cashew nut trees mainly for shade along the edges of the various boundaries in the tea and rubber plantations, many of which have recently changed from British to Indian ownership. 36/ Acreage trends during the post-war years will likely be largely determined by the estate plantings which, in turn, will depend upon price relationships.

The Government of India is reported recently to have sent communications to various cashew nut organizations in south India, drawing

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35/ Walker, Jay. The cashew nut industry in western India. United States Department of State, Consular Service, report No. 135. 13 pp. October 10, 1931. (Unpublished.)

36/ See footnote 21, p. 17.

their attention to the prevailing high prices of cashew nut kernels in India and their possible repercussions in foreign markets, which might, in the long run, affect the future of the industry, and inviting suggestions as to possibilities for remedying this situation. The Government is also reported to have requested detailed figures of expenses incurred from the point of collection of nuts to the point where kernels are ready for consumption and any other charges incurred during the process of production for the past 5 years, together with data on currently available stocks for domestic consumption and for exports.

The cashew nut industry, unlike most other industries, is organized so that all of the operations incident to final disposal of the products are carried on under the supervision of a single person or company. The dealer, the manufacturer, packer, and exporter are generally the same individual. One man absorbs all of the shocks of fluctuating prices. There is no division of risks. Most of the regular cashew nut dealers and shippers try to arrange their buying schedule so as to keep their labor force employed as long as possible. But the work is likely to be seasonal unless the east African nuts can be imported to be processed during the months between the completion of the processing of the domestic nuts from one crop and the arrival of nuts for processing from the succeeding crop.

An acute labor shortage is reported to have developed during the war emergency. This is attributed, in part, to the recruitment of men to coolie labor which has increased family income to such an extent that women, formerly employed in factories at shelling nuts, no longer feel obliged to work. An additional factor in the situation has been food rationing. The mass of migratory labor which once congregated around the factory districts during the processing season has been obliged to return to its permanent home in order to be eligible for rationed food grains. The labor shortage was reported to be one of the factors which influenced Indian dealers to oppose removal of the embargo on imports of unshelled nuts from east Africa. 37/

No official data are available to indicate the outturn of the current crop. Conditions, in general, are reported favorable and trade advices indicate a harvest of some 600,000 bags of 168 pounds each or about 45,000 long tons. Allowing for the average of 500 pounds of export grade suitable for the United States trade for each ton of raw nuts processed and 50 pounds of the nonshippable quality, the quantity of kernels suitable for shipment to the United States would be approximately 22,500,000 pounds and about 2,500,000 pounds would be suitable for consumption in India or elsewhere. These quantities would be increased to whatever extent raw unshelled nuts from Africa are

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37/ Schaffner, Louise. Forecast of the cashew nut industry, 1944-45. United States Department of State, Foreign Service, report No. 23. 3 pp. February 7, 1945. (Unpublished.)

imported for processing in India. Reports indicate that around 25,000 long tons of nuts are stored in Africa, but some deterioriation during storage is reported and Indian dealers appear reluctant to accept offers without a guarantee of quality. 38/ While these data are preliminary, they suggest increased offerings of cashew kernels on the United States market during 1945 provided shipping space is available and the Indian labor shortage is relieved.

38/ Bower, Roy E. B. The Indian cashew nut industry, 1944-45. United States Department of State, Foreign Service, report No. 40. 3 pp. March 16, 1945. (Unpublished.)

APPENDIX

Table 1.--India: Cashew Nuts--Quantity harvested, imported, and available for manufacture, 1925-44

Year	Grown and collected	Imported	Available for manufacture
	1,000 pounds	1,000 pounds	1,000 pounds
1925	11,200	None	11,200
1926	16,800	None	16,800
1927	24,640	None	24,640
1928	29,120	1,120	30,240
1929	40,320	2,240	42,560
1930	40,320	6,720	47,040
1931	40,320	11,200	51,520
1932	40,320	15,680	56,000
1933	51,520	11,200	62,720
1934	64,960	17,920	82,880
1935	76,160	51,520	127,680
1936	89,600	67,200	156,800
1937	106,400	64,960	170,240
1938	109,760	69,440	179,200
1939	112,000	67,200	179,200
1940	1/ 97,440	2/64,960	162,400
1941	117,600	2/87,360	204,960
1942	100,800	2/3/22,400	123,200
1943	75,900	2/4/ 1,658	77,558
1944	67,200	None	67,200

Data 1925-36 from All-India Cashew Nut Merchants' Association, Memorial to the Government of India "Menace to the Indian Cashew Plantations and Industry," 97 Periamet, Madras, India, November 11, 1936. Data for 1937-44 from reports of U. S. Consuls at Madras and Bombay, India, except as otherwise noted.

1/ This appears to be an unrevised preliminary estimate. Neither the texts of consular reports on the industry nor exports indicate so short a crop in 1940.

2/ Official exports from Mozambique, Portuguese East Africa.

3/ In September of 1941, Indian bankers were reported to have advised Indian merchants that money as loans would not be advanced against purchases of new crop of African nuts because of uncertainties concerning the international shipping facilities. (Feld, Nicholas, United States Vice Consul, Madras, India, Report No. 26462, October 13, 1941.)

4/ Imports from Portuguese East Africa prohibited from April 1943.

Table 2.--India: Cashew kernels--Estimated production and apparent disposition, 1925-44

Year	Estimated production 1/		Apparent disposition		
			Exported to United States: Shippable	Exported to other countries and/or consumed in India: Shippable	Exported to other countries and/or consumed in India: Nonshippable
	Shippable	Nonshippable			
	Million lbs.	Million lbs.	Million lbs.	Million lbs.	Million lbs.
1925	2.50	.25	1.5	1.0	.25
1926	3.75	.375	2.5	1.25	.375
1927	5.50	.550	4.0	1.50	.550
1928	6.75	.675	5.0	1.25	.675
1929	9.5	.950	7.5	2.00	.950
1930	10.5	1.05	8.5	2.00	1.05
1931	11.5	1.15	9.0	2.50	1.15
1932	12.5	1.25	9.7	2.80	1.25
1933	14.0	1.40	11.3	2.70	1.40
1934	18.5	1.85	15.0	3.50	1.85
1935	28.5	2.85	23.0	5.50	2.85
1936	35.0	3.50	30.0	6.00	3.50
1937	38.0	3.80	2/26.8	11.20	3.80
1938	40.0	4.0	2/26.1	13.90	4.00
1939	40.0	4.0	2/29.5	10.50	4.00
1940	36.3	3.63	2/29.0	7.3	3.63
1941	45.8	4.58	2/35.6	10.2	4.58
1942	27.5	2.75	2/17.7	9.8	2.75
1943	17.2	1.72	2/ 3.5	13.7	1.72
1944	15.0	1.50	2/10.0	5.0	1.50

Data for 1925-36 from All-India Cashew-Nut Merchants' Association Memorial to the Government of India, "Menace to the Indian Cashew Plantations and Industry," 97 Periamet, Madras, India, November 11, 1936. Data for 1937-44 computed from data in table 1, except as otherwise noted.

1/ Estimated at 500 pounds of shippable kernels and 50 pounds of nonshippable kernels per ton of nuts processed.

2/ Imports into the United States, more than 98 percent of which are of Indian manufacture.

Table 3.--United States: Cashew Nuts--Imports, 1930-44

Calendar year	Quantity	Value	Computed tariff revenue	Tariff equivalent as ad valorem
	(Pounds)	(Dollars)	(Dollars)	(Percent)
1930 (1/	3,039,261)	678,173)	30,393)	4.48)
(2/	3,898,772)	812,171)	77,975)	9.60)
(3/	7,938,033	1,490,344	107,368	--
1931	10,356,431	2,074,490	207,129	10.0
1932	8,623,389	1,393,492	172,468	12.0
1933	12,526,392	1,609,461	250,528	15.6
1934	14,899,153	2,349,261	297,983	12.7
1935	22,376,432	3,658,860	447,529	12.2
1936	22,101,814	3,706,833	442,036	11.9
1937	26,848,147	4,112,576	536,963	13.1
1938	26,068,828	3,515,349	521,377	14.8
1939	29,466,100	4,039,204	589,322	14.6
1940	28,939,561	4,093,188	578,791	14.1
1941	35,591,816	5,883,752	711,836	12.1
1942	17,720,730	3,905,830	354,415	9.1
1943	3,542,036	1,116,403	70,841	6.3
1944	15,778,868	9,084,136	315,577	3.5

U. S. Department of Commerce, Foreign Trade and Navigation of the United States, 1930-41, official records 1942-44.

1/ January 1 - June 17, imports on which tariff rate of 1 cent per lb. applied.
2/ June 18 - December 31, imports on which tariff rate of 2 cents per lb. applied. Rate of 2 cents per lb. has applied since June 8, 1930 on all imports.
3/ Total for calendar year.

Table 4.--Canada: Cashew kernels--Imports 1939-44

Year and country of origin	Quantity	Value	
		Canadian currency	United States currency
	Pounds	Dollars	Dollars
1939 1/			
India	960,270	146,116	132,833
United States	14,199	4,075	3,705
Total	974,469	150,191	136,537
1940			
India	1,189,475	186,597	169,633
United States	42,250	11,196	10,178
Total	1,231,725	197,793	179,812
1941			
India	2,706,004	558,518	507,743
Total	2,706,004	558,518	507,743
1942			
India	2,562,300	681,940	619,945
United States	7,475	1,710	1,555
Total	2,569,775	683,650	621,499
1943			
India	35,000	8,436	7,669
United States	10	14	12
Total	35,010	8,450	7,682
1944 2/			
India	---	---	---
United States	---	---	---
Total	222,520	163,423	148,566

Department of Trade and Commerce, Dominion Bureau of Statistics, "Trade of Canada."

1/ Imports April 29 - December 31.
2/ Preliminary.

Table 5.--India: Cashew kernels--Exports, countries of destinations, 1937-38, 1938-39 1/

Countries of destination	1937-38		1938-39	
	Long tons	Pounds	Long tons	Pounds
British				
United Kingdom	612	1,370,880	712	1,594,880
Canada	271	607,040	377	844,480
Union of South Africa	81	181,440	108	241,920
Australia	65	145,600	88	197,120
New Zealand	45	100,800	34	76,160
Other British	62	138,880	50	112,000
Total British	1,136	2,544,640	1,369	3,066,560
Foreign				
United States	10,735	24,046,400	11,049	24,749,760
France	334	748,160	407	911,680
Netherlands	330	739,200	284	636,160
Belgium	140	313,600	318	712,320
Sweden	31	69,440	29	64,960
Finland	27	60,480	25	56,000
Other foreign	12	26,880	18	40,320
Total foreign	11,609	26,004,160	12,130	27,171,200
Total British and foreign countries	12,745	28,548,800	13,499	50,237,760

Department of Commercial Intelligence and Statistics
Annual Statement of Seaborne Trade of British India with the British Empire and Foreign Countries.

1/ Fiscal year beginning April 1.

Table 6.--Brazil: Cashew kernels--Exports, quantity by countries of destination and value, 1934-43

Year	Countries of Destination, Quantity								Total	
	United States	Argentina	Uruguay	United Kingdom	Netherlands	Belgium-Luxumburg	Sweden	Other countries	Quantity	Value 1/
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Dollars
1934	33	---	---	825	---	---	---	---	858	8,595
1935	35,260	---	---	---	---	---	---	---	35,260	409,468
1936	196,813	---	---	49	---	5,236	---	2/3,327	205,425	1,637,992
1937	47,095	---	---	---	22,216	12,196	14,054	3/16,338	111,899	999,563
1938	1,455	12,125	---	---	---	6,834	13,448	4/ 2,646	36,508	320,836
1939	1,006,654	1,102	---	1,120	---	---	4,409	---	1,013,285	998,471
1940	---	---	---	---	---	---	---	---	---	---
1941	---	8,818	---	---	---	---	---	---	8,818	206,518
1942	4,409	178,485	7,716	---	---	---	---	---	190,610	4,498,840
1943	---	59,705	27,871	---	---	---	---	---	87,576	2,151,414

Comercio Exterior do Brazil Servico de Economica e Financeira fo Tesouro Nacional Minesterio da Fazenda.

1/ Conversions to United States values made at free rate of exchange 1934-38. 1939 and subsequent conversion 30 percent at official rate and 70 percent at free rates of exchange.
2/ To Germany.
3/ To Germany 12,125 pounds; to France 4,012 pounds; to Japan 41 pounds.
4/ To France.

Table 7.--Mozambique (Portuguese East Africa): Cashew nuts, unshelled--Exports, 1928-43

Year	Quantity	Value
	1,000 pounds	Dollars (U.S.)
1928	8,862	87,713
1929	10,728	73,667
1930	14,396	96,652
1931	22,798	160,139
1932	20,238	148,659
1933	24,661	149,675
1934	28,620	158,212
1935	57,611	295,509
1936	62,516	633,951
1937	88,248	998,507
1938	56,757	419,610
1939	64,168	490,460
1940	69,875	593,970
1941	86,440	691,940
1942	22,553	227,370
1943	1,638	18,290

Republica Portuguesa, Colonia de Moçambique, Repartição Tecnica de Estatistica, Estatistica do Comércio Externo e da Navegação, 1943 and earlier years.

Table 8.--United States: Cashew nut shell liquid, (oil)--
Imports, by countries of origin, 1943 and 1944

Year and country	Quantity	Value
	Pounds	Dollars
1942 1/	80,496	3,914
1943		
Brazil	22,280	2,697
India	6,625,773	850,277
South Asia 2/	161,685	6,748
Total	6,810,738	859,722
1944		
Haiti	4,442	552
Brazil	808,162	93,215
India	3,843,164	454,654
South Asia 2/	100,400	6,293
Total	4,756,168	554,714

United States Department of Commerce, official records of imports

1/ Not separately classified in 1942 but so far as is known no kernel oil is manufactured for export in India, Brazil or other producing areas.
2/ South Asia includes Portuguese India, Burma and Ceylon and certain other areas of minor importance in the cashew nut industry.

Table 9.--Canada: Cashew nut shell liquid--Imports, 1941-44 1/

Year	Quantity	Value	
		Canadian currency	U. S. currency 2/
	Pounds	Dollars	Dollars
1941 3/	54,943	7,480	6,800
1942	240,985	39,735	36,123
1943	186,350	19,404	17,640
1944 4/	127,600	28,854	26,231

Department of Trade and Commerce, Dominion Bureau of Statistics, "Trade of Canada."

1/ All from the United States.
2/ Conversions at the official rate of the Canadian dollar, equivalent to 0.909090 United States dollar.
3/ April 29 - December 31, 1941.
4/ Preliminary.

Table 10.--Cashew kernels: Annual average price, Indian dealers, 1925-44 1/

Year	United States currency	British currency
	Cents per pound	Shillings per 112 pounds
1925	41	190
1926	41	190
1927	39	180
1928	35	160
1929	32	150
1930	32	150
1931	30	150
1932	11	70
1933	28	150
1934	33	150
1935	19	105
1936	20	90
1937	19	80
1938	20	90
1939	14	72
1940	2/ 18	2/ 106
1941	2/ 21	2/ 115
1942	2/ 32	2/ 178
1943	2/ 60	2/ 333
1944	2/ 73	2/ 405

Data for 1925-36 from All-India Cashew Nut Merchants Association, Memorial to the Government of India. 1937-44 data from United States consuls in India.

1/ Prompt shipment, cost, and freight estimated Indian merchants' selling price, New York basis.
2/ Data are incomplete, averages for months for which statistics were available.

Table 11:--Cashew nuts, shelled--Price per pound New York, by months
1932-44

Grades	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual average 1/
	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
1932													
Whole	35.33	32.50	32.25	31.50	29.25	28.50	28.88	26.00	25.80	26.00	25.75	23.80	28.80
Pieces	15.25	15.25	15.06	14.25	13.62	13.50	13.50	13.50	13.50	13.75	13.94	13.75	13.99
1933													
Whole	23.38	24.00	21.30	21.50	20.62	21.00	22.75	24.60	25.62	26.50	26.50	26.25	23.70
Pieces	15.06	13.25	13.25	12.94	13.81	14.00	16.25	18.20	18.69	18.94	19.00	18.75	16.01
1934													
Whole	25.94	25.00	25.70	26.69	26.80	26.88	27.25	27.25	27.25	24.50	24.70	25.00	26.08
Pieces	18.31	17.00	17.20	17.56	17.32	16.81	16.75	16.75	16.75	16.75	16.05	15.00	16.85
1935													
Whole	25.00	25.00	25.00	25.00	26.50	26.83	27.88	28.30	28.81	29.05	28.75	27.25	26.95
Pieces	15.33	15.50	15.56	15.62	15.85	16.50	18.62	17.75	17.94	19.50	20.00	20.00	17.35
1936													
Whole	27.10	27.00	27.00	25.00	24.38	24.75	26.10	25.81	27.06	28.25	28.25	27.12	26.48
Pieces	20.00	19.50	19.50	18.30	17.94	18.25	18.88	18.66	21.00	21.00	21.00	20.44	19.54
1937													
Whole	22.50	24.00	25.50	23.88	25.00	22.62	22.00	23.25	24.65	24.81	23.58	23.00	23.73
Pieces	20.25	20.38	20.50	19.88	19.97	19.00	19.00	19.00	19.05	19.06	17.83	16.58	19.21
1938													
Whole	22.81	19.25	19.30	20.25	22.50	24.40	26.50	26.62	27.10	27.50	27.50	26.50	24.19
Pieces	16.06	15.00	13.15	14.50	14.75	14.75	14.75	14.75	14.75	15.50	15.50	15.25	14.89
1939													
Whole	25.81	24.92	23.55	22.50	22.50	22.00	22.00	21.95	22.69	23.67	23.40	22.22	23.10
Pieces 2/	14.84	14.50	14.38	13.66	13.66	13.79	14.02	15.76	18.33	18.04	17.70	15.00	15.31

1/ Averages for months for which data are available.
2/ Average of Standard and Fancy.

Continued

Table 11.--Cashew nuts, shelled--Price per pound New York, by months 1932-44--Continued.

Grades	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual average 1/
	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
1940													
Whole	22.12	21.92	21.56	22.00	19.80	21.38	22.25	22.00	22.75	22.80	22.75	22.75	22.01
Pieces 2/	17.75	17.50	17.00	16.75	16.75	19.59	20.81	20.00	20.19	20.12	n.q.	n.q.	18.65
1941													
Whole	22.75	22.75	23.81	38.75	38.75	n.q.	n.q.	n.q.	n.q.	n.q.	n.q.	n.q.	29.36
Pieces 3/	n.q.	n.q.	n.q.	23.00	23.80	24.00	27.40	26.50	26.50	27.00	26.67	26.75	25.74
1942													
Whole	No free market quotations available												
Pieces 3/	27.80	29.25	31.00	31.00	31.00	30.00	29.00	32.00	33.00	34.80	39.88	56.80	33.79
1943													
Whole 4/	76.96	83.56	86.58	97.00	n.q.	102.50	101.50	99.65	98.43	98.00	5/98.91	5/98.19	94.60
Pieces	62.32	65.12	66.20	72.00	72.75	74.00	74.00	73.08	72.00	72.00	75.64	75.19	71.19
1944													
Whole	98.00	98.00	101.33	101.00	101.00	95.50	94.39	91.50	89.17	86.50	94.18	101.00	95.96
Pieces	75.00	75.00	75.00	75.00	75.00	71.00	69.89	65.46	62.89	60.89	60.36	62.20	68.97

Compiled from quotations given in New York Journal of Commerce.
1/ Averages for months for which data are available.
2/ Average of Standard and Fancy.
3/ Fancy.
4/ 200-280 count.
5/ 300-320 count.

Chemical analyses of cashew products

Apple	Natural state		Dry weight	
	Green Percent	Ripe Percent	Green Percent	Ripe Percent
Moisture	86.00	86.00		
Ash	.85	.50	6.07	3.37
Ether extract	.60	.30	4.29	2.15
Glucose	4.40	8.40	31.50	60.00
Crude fiber	5.85	1.50	41.80	10.71
Tannin	.72	3.05	5.03	21.26
Tartaric acid	.58	.45	4.26	3.74
Total	99.00	103.20	93.25	101.23
Kernels				
Moisture	50.00	19.50		
Ash	1.75	2.20	5.05	2.75
Glucose	2.20	4.00	4.40	4.96
Crude fiber	21.50	27.40	43.00	34.03
Ether extract	10.50	34.20	21.00	42.48
Tannin	6.00	2.15	12.00	2.67
Nitrogenous subs.	7.87	10.50	15.74	13.04
Total	99.82	99.95	101.19	99.93

Ash of apple and kernel respectively

	Apple	Kernel
Hydrochloric acid	1.35	0.97
Sulphuric acid	3.70	3.06
(P_2O_5)	17.01	42.48
Oxides of alkaline earth metals	10.65	36.80
($NaCO_3$ / K_2CO_3)	67.31	16.89
Total	100.02	100.20

The shell of the cashew contains large cells in which there is a strong, acrid, and caustic odorous oil (liquid). This substance is known as cardol or cashew resin, from which is extracted anacardic acid. This liquid has a density of 1.014 but it must not be confused with oil from the kernels which was analyzed by Schaedler and which is contained in the kernels in the proportion of 40 to 50 percent. This last oil is yellowish, does not have a strong odor but is sweet and pleasant and has a density of .916.

Granato, Lourenco, Cultura do Cajueiro, Estab. Graphico Alongi & Gallo, 1913; p. 8-10 (Free translation from original in Brazilian language--chemical analyses according to Martina).

Chemical analyses of cashew kernel oil

An analysis of cashew kernel oil by Hughes and Davies of Bombay, India, shows the following values:

Specific gravity at 30/30° C.		0.9101
Saponification value		194.4
Iodine value		85.90
Acidity		.80 Oleic acid
Refractive index at 40° C.		52.40
Taste and odor	Similar to olive oil	

Merrell, George E., personal representative of the President of the United States, Relief to cashew trade in India, report no. 72. 3 pp. April 22, 1943.

Cashew products: Chemical analysis and physical characteristics

Cashew shell liquid----The shell which amounts to about 30 to 40 percent of the seed, yields a dark, viscous liquid (cashew nut shell oil) that, according to Joseph and Sudborough (Chem. Absts. 17, 1897 (1923)), contains a phenolic compound called "cardol" ($C_{32}H_{52}O_4$) and an acid $C_{22}H_{32}O_3$ which has been named anacardic acid. The oil has an iodine number of 296, an acid value of 107, a saponification value of 119, and a density at 26° C. of 1.0131. The shell contains about 20 percent of this so-called liquid or oil. This poisonous product is extracted locally and used for protecting books, etc., from the ravages of white ants or other insects. Various patents have been issued covering the extraction of the shell oil, and the equipment used: others describe methods for the manufacture of various products from this oil for use in protective coatings. Attention is called to "Cashew Nut Shell Liquid" by M. T. Harvey and S. Caplan, Ind. Eng. Chem. 32, 1306 (1940). Also see pages 74 to 101, vol. 1, 1941, "Protective and Decorative Coatings," J. J. Mattiello, Editor, John Wiley and Sons, New York.

Cashew kernels----The kernels, which weigh from 1 to 2 grams, contain from 38 to 46 percent of pale yellow oil. It has been examined by Niederstadt, Bolton and Jesson (Analyst, 40, 3 (1915)); C. D. V. Georgi (Malayan Agr. J. 10, 301 (1922)); Patel, Sudborough and Cruz (Phil. J. Sci., 23, 337 (1923)); Abstract, Analyst, 49, 39, (1924). The range of the characteristics reported is as follows: Sp. g. at 15° C. 0.911 to 0.918; at 26° C. 0.9105, $N_D^{40°}$ 1.4623 to 1.4633, at 30° C. 1.4665; Sap. v. 187 to 195; Iodine No. 79 to 85; Unsap. 0.4 to 1.5%; R. M. V. 1.6; Pal. No. 0.25: Acid 1.4 to 1.6; Titer 28° to 30°.

Patel, Sudborough, and Watson (loc. cit.) found that the fatty acids, from the sample of the oil which they examined consisted of 73.8 oleic; 7.7 linoleic, 6.4 palmitic, 11.2 steric and 0.5 percent of lignoceric acid, whereas West and Cruz reported that their oil contained 16.52 percent of saturated acids consisting chiefly of stearic acid, and the unsaturated fraction which amounted to 76.9 percent of the oil contained only oleic acid. This fraction after bromination gave no petroleum ether insoluble tetrabromide and its bromine content corresponded to the dibromide of oleic acid, which showed that the Philippine oil contained very little, if any, linoleic acid.

As the available supply of cashew kernels is used for edible purposes, there is little likelihood of the oil being expressed on a commercial scale, but when properly prepared it has a mild flavor and can be used for edible purposes.

Jamieson, George S. Ph. D., Vegetable Fats and Oils, Reinhold Publishing Corp. New York City, 1943. pp. 46-7.

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